

IDAHO DEPARTMENT OF FISH & GAME

Jerry M. Conley, Director

MOVEMENTS OF STOCKED CATCHABLE-SIZED RAINBOW TROUT
IN THE NORTH FORK PAYETTE RIVER



By

Patrick F. Chapman
Fish Hatchery Superintendent I
McCall Hatchery

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TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	2
Background	2
Description of Study Area	2
OBJECTIVES	4
TECHNIQUES USED	4
FINDINGS	7
Number of Tags Returned by Anglers	7
Movements of Trout Within the River	7
Movements of Trout to Cascade Reservoir	10
Length of Time in River Prior to Capture	10
DISCUSSION	10
Quality of Tag Return Information	10
Movements of Trout Within the River	15
Movements of Trout to Cascade Reservoir	16
Length of Time in River Prior to Capture	18
Angler Effort and Harvest of Tagged Trout	18
RECOMMENDATIONS	19
ACKNOWLEDGEMENTS	19
LITERATURE CITED	20

TABLE OF CONTENTS (Continued)

LIST OF TABLES	<u>Page</u>
Table 1. Tag numbers, date, and location where tagged trout were stocked in the North Fork Payette River, 1981	6
Table 2. Tag return data for fish reported caught from the North Fork Payette River study section listed by tag group, date, and location stocked, 1981	8
Table 3. Number of tagged fish stocked and number and percentage of tags returned from fish stocked in various locations of the North Fork Payette River, 1981	9
Table 4. Number and percentage of tag returns indicating distances moved from stocking locations in the North Fork Payette River	11
Table 5. Tag returns, location recovered, and distances moved from stocking location in the North Fork Payette River, listed by date stocked	12
Table 6. Tag returns, location recovered, and distances moved from stocking location in the North Fork Payette River, listed by location stocked	13

LIST OF FIGURES	
Figure 1. Map of study area	3
Figure 2. Locations tagged fish were stocked in the North Fork Payette River	5
Figure 3. Number and cumulative percentage of tagged fish reported caught and number of weeks spent in the river between stocking and capture	14
Figure 4. Discharge (cfs) of the North Fork Payette River at McCall, Idaho, 1 January - 31 December 1981 (adapted from U. S. Geological Survey, 1981)	17

ABSTRACT

During the summer of 1981, 8,000 jaw-tagged catchable rainbow trout were stocked in the North Fork Payette River and data from tags returned by anglers through December 1981 were analyzed. Anglers reported catching 846 (10.6% return) tagged trout from the N. F. Payette River. Most (72.3%) fish did not move a significant distance from location stocked, and of those exhibiting migration, most (69.3%) moved distances of less than one mile. Only one tagged fish was reported captured in Cascade Reservoir. Tagged fish captured by anglers spent an average of 31 days in the river prior to being caught, with greater than 50% of the fish being caught within three weeks of stocking.

Author:

Patrick F. Chapman
Fish Hatchery Superintendent I

INTRODUCTION

Background

In 1980, McCall Hatchery personnel stocked 10,000 catchable rainbow trout (Salmo gairdneri) in the North Fork Payette River between Cascade Reservoir and Payette Lake. At that time, we questioned whether angling pressure was sufficient to warrant stocking this number of fish. Also during that year, creel census on Cascade Reservoir revealed numerous hatchery-reared rainbow trout in the catch that were of unknown origin (Horner, personal communication). All catchable rainbow trout stocked in the reservoir that year were fin-clipped to indicate location stocked, but some fish caught were unclipped, suggesting that these fish moved into the reservoir from one of the tributaries stocked by McCall Hatchery. Horner felt that some of these fish may have migrated out of the North Fork Payette River. To determine if this was the case, McCall Hatchery personnel conducted a study utilizing jaw-tagged trout stocked in the North Fork Payette River in 1981.

Description of the Study Area

The study area is located between the towns of McCall and Cascade in the mountains of west-central Idaho and includes over 24 miles of the North Fork Payette River between Cascade Reservoir and Payette Lake and also encompasses Cascade Reservoir (Fig. 1). Flow in the North Fork Payette River is controlled by the regulating dam on Payette Lake and fluctuates in the spring and summer months according to downstream irrigation needs. Mean discharge during the 69 year period from 1922 to 1980 was 366 cfs (Luscumb, personal communication).

The trout fishery in the North Fork Payette River is supported by annual releases of approximately 10,000 hatchery-reared, catchable-sized (>6 in) rainbow trout. Gamefish populations in the river include large numbers of mountain whitefish (Prosopium williamsoni); seasonally, moderate numbers of spawning kokanee salmon (Oncorhynchus nerka); small numbers of wild rainbow trout, and incidental populations of cutthroat trout (Salmo clarki), bull trout (Salvelinus confluentus), brook trout (Salvelinus fontinalis), and lake trout (Salvelinus namaycush).

Cascade Reservoir is one of the largest bodies of water in Idaho when full, covering a surface area of 28,300 acres (Horner and Rieman 1981), and is fed by three major tributaries: the North Fork Payette River, Gold Fork River, and Lake Fork Creek, and many minor tributaries. The fishery in Cascade Reservoir consists mainly of hatchery-reared rainbow trout, coho salmon (Oncorhynchus kisutch) and yellow perch (Perca flavescens).

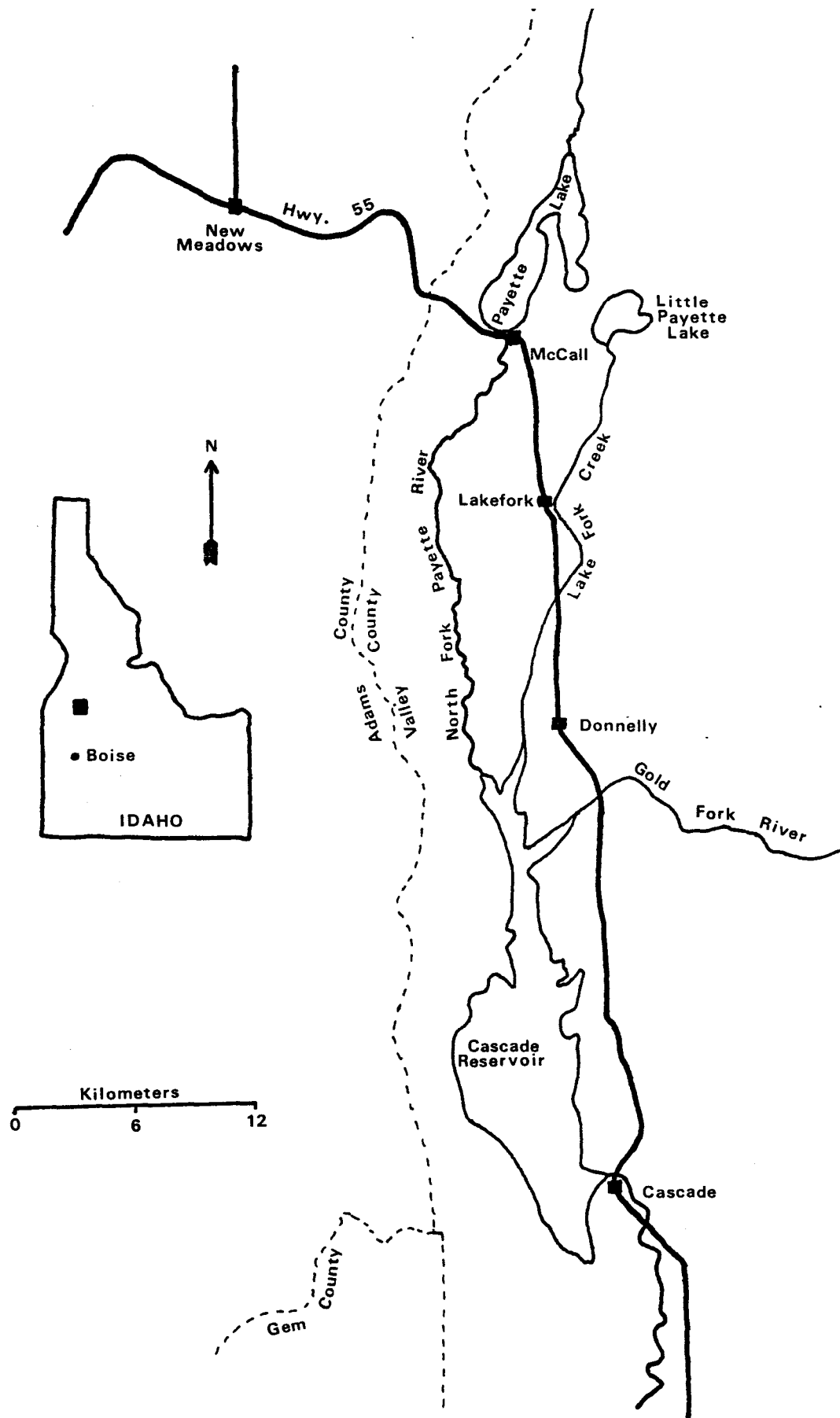


Figure 1. Map of study area.

OBJECTIVES

1. Determine the movement of catchable rainbow trout stocked at various locations in the North Fork Payette River.
2. Determine if catchable rainbow trout stocked in the North Fork Payette River contribute to the Cascade Reservoir fishery.
3. Determine length of time stocked catchable rainbow trout remain in the North Fork Payette River before being caught.
4. Determine if angling pressure warrants stocking 8,000 to 10,000 catchable rainbow trout in the North Fork Payette River between Cascade Reservoir and Payette Lake.

TECHNIQUES USED

Between 23 May and 26 August 1981, 8,000 catchable-sized rainbow trout reared at Hagerman Hatchery, Hagerman, Idaho, averaging 4.2 oz each were tagged with individually numbered, size 8 monel jaw tags. Tagging was performed on the day of each stocking. Fish were anesthetized with tricain methane sulfonate (MS-222) prior to tagging and allowed to recover in a tank of fresh water after tagging. We transported the fish to stocking location in an oxygenated fish tank filled with water from the hatchery collection basin.

Tagged fish were stocked at six locations (Fig. 2) on eight different days (Table 1) with location stocked, date, and tag numbers recorded for each stocking. After 30 June, no fish were stocked below Sheep Bridge because of high water temperatures ($> 21^{\circ}\text{C}$).

Tag return boxes were placed at major access points along the river and one access point at Cascade Reservoir. Sporting goods retailers in McCall and Cascade agreed to accept information from anglers and informational signs were posted in these establishments, as well as along the river and reservoir. News releases appeared in newspapers and on the local radio station informing the public of the study and requesting assistance in supplying information. Creel census workers also checked anglers for possession of tagged fish on the reservoir. The study was terminated on 1 January 1982 when the trout season closed in the North Fork Payette River.

Information on movement and time spent in the river for each fish caught was returned to anglers that supplied us with an address and requested this information.

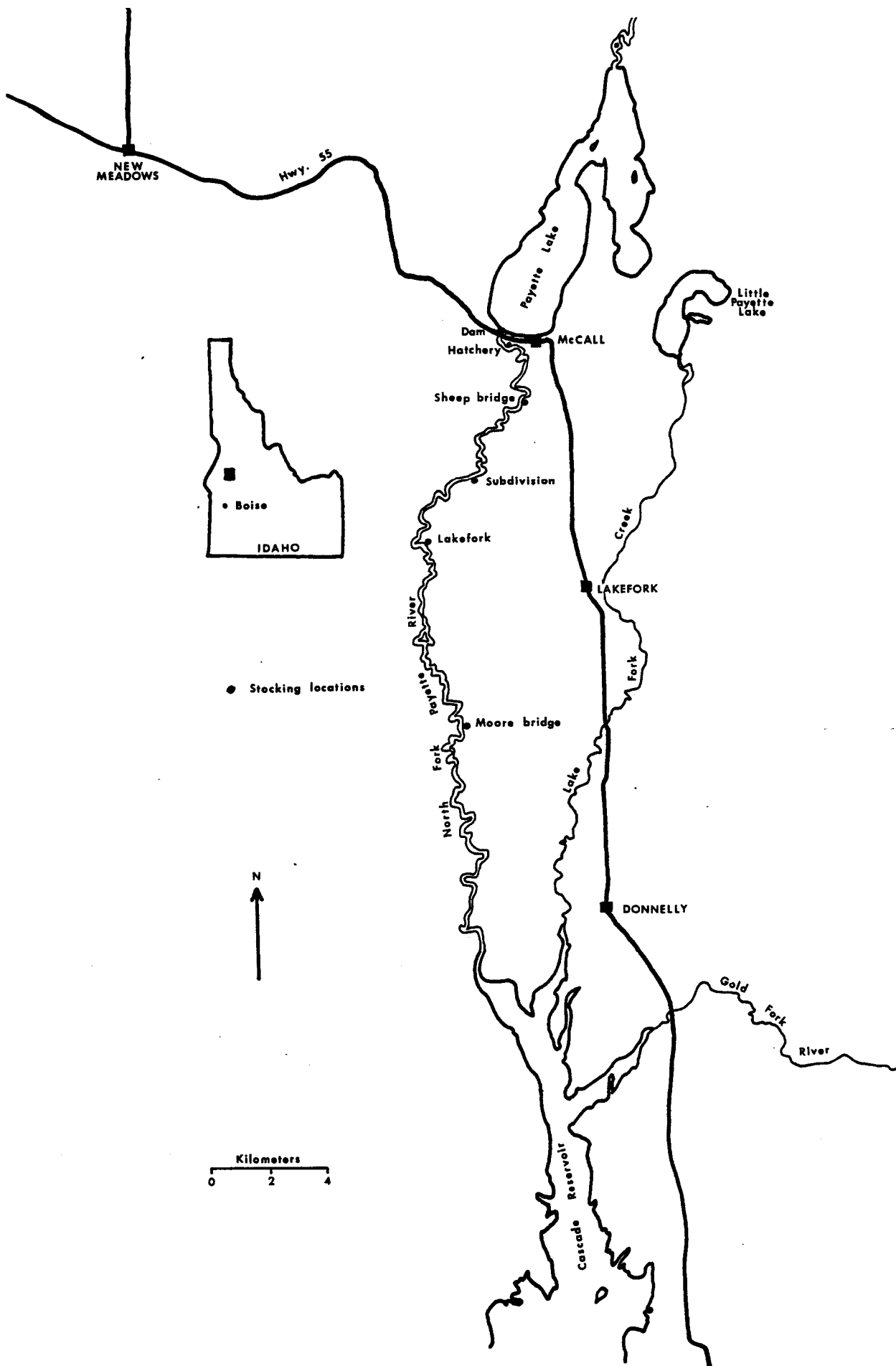


Figure 2. Locations tagged fish were stocked in the North Fork Payette River.

Table 1. Tag numbers, date, and location where tagged trout were stocked in the North Fork Payette River, 1981.

<u>Tag numbers</u>	<u>Date stocked</u>	<u>Location stocked</u>
K 1-500	5/22	Between dam and hatchery
501-1000	5/22	Sheep Bridge and Moore Bridge
1001-1400	6/11	Between dam and hatchery
1401-1800	6/11	Sheep Bridge
1801-2000	6/12	Subdivision
2001-2200	6/12	Lakefork
2201-2400	6/12	Moore Bridge
2401-2700 ^{1/}	6/30	Dam
2701-3000	6/30	Hatchery
3001-3300	6/30	Sheep Bridge
3301-3500	6/30	Subdivision
3501-3700	6/30	Lakefork
3701-3900	6/30	Moore Bridge
3901-4300	7/16	Dam
4301-4600	7/16	Hatchery
4601-4900	7/16	Sheep Bridge
4901-5300	7/29	Dam
5301-5600	7/29	Hatchery
5601-6000	7/29	Sheep Bridge
6001-6700	8/26	Dam
6701-7300	8/26	Hatchery
7301-8000	8/26	Sheep Bridge

^{1/} Twenty-three fish with tags in 2400 series planted at hatchery on 6/19.

Fish movement was considered to be the distance between stocking and catch locations. River length was determined with a map wheel on standard 1:24,000 and 1:62,500 U. S. Geological Survey topographic maps.

FINDINGS

Number of Tags Returned by Anglers

Anglers reported catching 869 tagged fish during the course of the study. However, 23 tag numbers were reported twice, probably due to errors in identifying and reporting the tag number, since no return cards indicated that tagged fish were released. In analyzing the data, duplicate returns were counted as one return, but data for movement and time in the river for these returns was not used. The net number of tag returns, therefore, was 846, which represents a return of 10.6% of the tagged fish stocked. Percentage returns for each stocking location and date varied considerably, and ranged from 1% to 18% (Table 2). Percentage returns from fish stocked at the three locations above and including Sheep Bridge were considerably greater than for the three locations below Sheep Bridge (>9.0% and < 2.5%, respectively) (Table 3).

Movements of Trout Within the River

The first three stockings of tagged fish were at multiple locations without recording the tag numbers. of fish released at each specific location (Table 2). Consequently, movement data for those fish stocked on 22 May at Sheep and Moore bridges is not very meaningful, since it is not clear where fish caught from this stocking were released. A fish caught at Sheep Bridge from this stocking, for instance, may have been released at Sheep Bridge, and therefore, did not move from the stocking location, or may have been released at Moore Bridge, and therefore, moved 13 miles upstream. This problem of uncertain movement occurs with the 22 May and 11 June stockings between the dam and hatchery to a lesser degree since the distance between the two locations is only 0.5 miles.

In analyzing movement data of fish caught from these three stockings, I made the assumption that fish caught at a location that was stocked were released there, and therefore, did not migrate from the release site. Those fish that definitely showed movement from release site (caught upstream or downstream from Sheep and Moore bridges and downstream from the hatchery) were deemed to have moved the lesser of the two possible distances (i.e., fish tag K 600 was recovered two miles below Sheep Bridge and was deemed to have moved two miles downstream, rather than 11 miles upstream from Moore Bridge). These assumptions probably are not strictly valid, but are supported by the

Table 2. Tag return data for fish reported caught from the North Fork Payette River study section listed by tag group, date, and location stocked, 1981.

Tag group	Date stocked	Location stocked	Number returned	Percentage returned	Number of returns indicating caught	Mean days river	Number of returns indicating caught	Distance moved					
								None	Percentage			km	Percentage
K 1-500	5/22	Dam to hatchery	77	15.4	60	43	70	46	65.7	9	12.9	15	21.4
501-1000	5/22	Sheep and Moore	45	9.0	32	60	37	17	46.0	7	18.9	13	35.1
1001-1400	6/11	Dam to hatchery	23	5.8	20	34	21	19	90.5	0	0.0	2	9.5
1401-1800	6/11	Sheep bridge	12	3.0	10	39	11	7	63.6	1	9.1	3	27.3
1801-2000	6/12	Subdivision	2	1.0	2	32	1	0	0.0	0	0.0	1	100.0
2001-2200	6/12	Lakefork	2	1.0	2	40	2	0	0.0	0	0.0	2	100.0
2201-2400	6/12	Moore bridge	4	2.0	3	34	3	0	0.0	0	0.0	3	100.0
2401-2700 ^{1/}	6/30	Dam	50	18.0	42	25	42	30	71.4	12	28.6	0	0.0
2701-3000 ^{1/}	6/30	Hatchery	47	14.6	37	24	41	30	73.2	11	26.8	0	0.0
3001-3300	6/30	Sheep bridge	34	11.3	24	37	30	25	83.3	3	10.0	2	6.7
3301-3500	6/30	Subdivision	8	4.0	8	23	6	4	66.7	0	0.0	2	33.3
3501-3700	6/30	Lakefork	9	4.5	9	28	5	1	20.0	0	0.0	4	80.0
3701-3900	6/30	Moore bridge	6	3.0	6	30	5	3	60.0	1	20.0	1	20.0
3901-4300	7/16	Dam	62	15.5	44	25	39	31	79.5	8	20.5	0	0.0
4301-4600	7/16	Hatchery	30	10.0	26	36	26	17	65.4	8	30.8	1	3.8
4601-4900	7/16	Sheep bridge	49	16.3	32	30	40	28	70.0	8	20.0	4	10.0
4901-5300	7/29	Dam	44	11.0	36	31	38	33	86.8	5	13.2	0	0.0
5301-5600	7/29	Hatchery	28	9.3	44	27	26	20	76.9	5	19.2	1	3.5
5601-6000	7/29	Sheep bridge	66	16.5	51	23	53	43	81.1	7	13.2	3	5.7
6001-6700	8/26	Dam	55	7.9	48	35	51	24	47.1	27	52.9	0	0.0
6701-7300	8/26	Hatchery	76	12.7	66	30	69	63	91.3	6	8.7	0	0.0
7301-8000	8/26	Sheep bridge	117	16.7	77	20	78	61	78.2	15	19.2	2	2.6
Totals			846	x=10.6	679	x = 31	694	502	x = 72.3	133	x= 19.2	59	x = 8.1

^{1/} Twenty-three fish tagged with 2400 series tags and released 6/19 at hatchery. Returns from these included in 2701-3000 data.

Table 3. Number of tagged fish stocked and number and percentage of tags returned from fish stocked in various locations of the North Fork Payette River, 1981.

Stocking location	Number of fish stocked	Number of tags returned	Percentage returned
Dam to hatchery	900	100	11.1
Sheep and Moore Br.	500	45	9.0
Dam	1,777	211	11.9
Hatchery	1,523	181	11.9
Sheep Bridge	2,100	278	13.2
Subdivision	400	10	2.5
Lakefork	400	11	2.8
Moore Bridge	400	10	2.5
Totals	8,000	846	$\bar{x} = 10.6$

fact that the majority (72.3%) of tagged fish caught during the study exhibited no movement from location released, and of those that did migrate from the stocking location, more than 69% moved less than one mile (Table 4).

More reports of tag returns indicated the location where tagged fish were caught than indicated the date caught, with 82% (694) of the returns having usable information on location and 80% (679) of the returns having usable information on date caught. At least one fish from each stocking migrated 1/8 mile or more, and 27.7% of all returns indicated movement greater than 1/8 mile (Table 2). The majority (69.3%) of fish which left the stocking location moved less than one mile. Of the 59 fish that migrated distances of one mile or more, 61% moved downstream an average of 3.9 miles, and 39% migrated upstream an average of 4.1 miles. More fish from early releases migrated distances greater than one mile than did fish in later releases (Table 5). Fish stocked at locations below Sheep Bridge exhibited more movement than those released in other areas (Table 6). However, most (72.3%) fish caught during the study did not migrate from the location stocked (Table 4).

Movements of Trout to Cascade Reservoir

Only one fish was reported caught from Cascade Reservoir, at Tamarack Falls, which is the interface of flowing and slack water. Stocked at the Lakefork site, this fish migrated downstream 15 miles.

Length of Time in River Prior to Capture

Tagged fish reported caught during the study spent an average of 31 days in the river, but ranged from an average of 20 days to an average of 60 days for each different release date and location (Table 2). More fish were caught within the first week after stocking than any other week after that time and more than 50% of all fish were caught within three weeks after stocking (Fig. 3).

DISCUSSION

Quality of Tag Return Information

Due to budgetary and time constraints, the only feasible method of data collection for this study was by voluntary reporting of catch by anglers. The offer to provide information on the angler's catch was made to induce greater cooperation from the public. A high degree of reporting catch information probably was obtained as a result of this, as well as due to good publicity of the study.

Table 4. Number and percentage of tag returns indicating distances moved from stocking locations in the North Fork Payette River.

	<u>Distance moved</u>		
	<u>None</u>	<u><one mile</u>	<u>>one mile</u>
Number of tag returns	502	133	59
Percentage of tag returns	72.3	19.2	8.5

Table 5. Tag returns, location recovered, and distances moved from stocking location in the North Fork Payette River, listed by date stocked.

<u>Date stocked</u>	Number of tag returns indicating location recovered	<u>Distance moved</u>					
		<u>None</u>	<u>%</u>	<u><1 mi</u>	<u>%</u>	<u>>1 mi</u>	<u>%</u>
5/22	107	63	58.9	16	14.9	28	26.2
6/11	32	26	81.3	1	3.1	5	15.6
6/12	6	0	0.0	0	0.0	6	100.0
6/30	129	93	72.1	27	20.9	9	7.0
7/16	105	76	72.4	24	22.8	5	4.8
7/29	117	96	82.1	17	14.5	4	3.4
8/26	198	148	74.8	48	24.2	2	1.0

Table 6. Tag returns, location recovered, and distances moved from stocking location in the North Fork Payette River, listed by location stocked.

<u>Location stocked</u>	Number of tag returns indicating location recovered	<u>Distance moved</u>					
		<u>None</u>	<u>%</u>	<u><1 mi</u>	<u>%</u>	<u>>1 mi</u>	<u>%</u>
Dam-hatch.	91	65	71.4	9	9.9	17	18.7
Sheep & Moore Br.	37	17	46.0	7	18.9	13	35.1
Dam	170	118	69.4	52	30.6	0	0.0
Hatchery	162	130	80.3	30	18.5	2	1.2
Sheep Br.	212	164	77.4	34	16.0	14	6.6
Subdiv.	7	4	57.1	0	0.0	3	42.9
Lakefork	7	1	14.3	0	0.0	6	85.7
Moore Br.	8	3	37.5	1	12.5	4	50.0

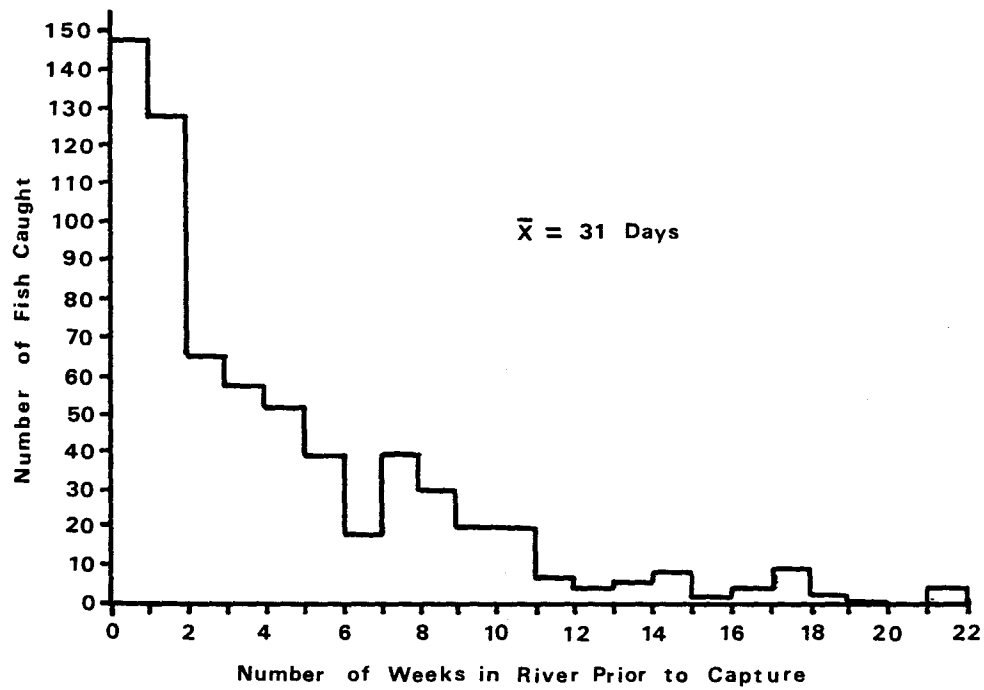
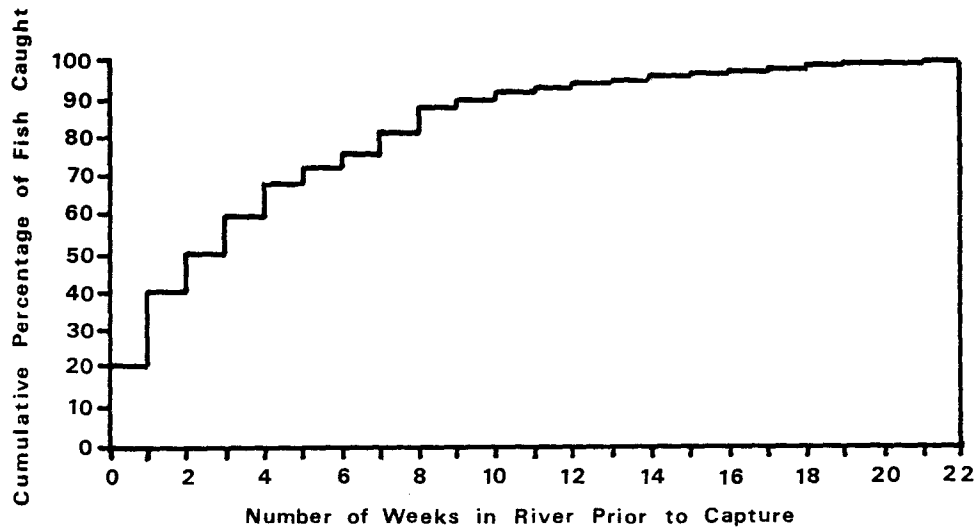


Figure 3. Number and cumulative percentage of tagged fish reported caught and number of weeks spent in the river between stocking and capture.

In any study that relies on voluntary reporting with no means of confirming the supplied information, a certain amount of error and inadequate information must be expected. Shetter (1947) obtained usable movement information from 88.3% of voluntary tag returns, which is slightly greater than the 82% usable movement information obtained from tag returns in this study. Much valuable information was unavailable or unusable due to duplicate returns and failure of anglers to provide the date or location caught. A significant number of returns consisted of jaw tags dropped in the return boxes with no information, and therefore useless except for calculating number and percentage returned. In future studies of this nature, more complete information might be recovered if pre-printed tag return cards listing each needed piece of information are provided to the anglers.

Anglers' reporting of the location tagged fish were caught was not as detailed as we sought. Generally, anglers did not report distances from landmarks of under 1/2 mile, and reported long distances in terms of distance from major landmarks rather than at some particular spot in the river (i.e., "two miles below Sheep Bridge" rather than "at gravel pit below subdivision"). As a consequence, fish reported as not having moved from the location stocked may actually have migrated 1/8 mile or so. From personal contact with anglers and from analyzing the data, it appears that some anglers miscalculated, to varying degrees, distances they reported. Although these errors may not be significant, the relative accuracy of this data compared with data collected by trained personnel should be noted.

Calculated distances moved for fish reported caught at particular landmarks along the river probably are more accurate than for those reported caught long distances from a landmark (i.e., "three miles below Sheep Bridge"). In the first case, distance between the landmark where the fish was caught and where it was stocked is easily and accurately calculated on a map, while in the latter case, distance moved is based solely on the angler's estimation of distance.

Movements of Trout Within the River

We found from this study that the majority (72.3%) of catchable-sized rainbow trout stocked in the North Fork Payette River did not migrate from the location stocked and that only 8.5% migrated distances of over one mile. This reveals that most fish of the particular strain used, will not migrate to Cascade Reservoir and contribute to that fishery, but rather will remain in the general vicinity of the location stocked and be available to the angler there.

Other researchers report similar results in movement studies of hatchery-reared rainbow trout. Cresswell (1981) in a review of the literature on this subject reports that most researchers recovered greater than 90% of hatchery-reared rainbow trout within 3.75 miles of stocking location. Cooper (1952) found 88.3% of rainbow trout stocked in the Pigeon River, Michigan, did not migrate from the location stocked when water temperatures exceeded 12.8 C. Bjornn and Mallet (1964) in a study on the Salmon River upstream from Challis, Idaho, reported that 84.6% of hatchery-reared rainbow trout stocked in June and caught the same year did not move distances greater than one mile.

In our study, high water conditions probably contributed to the low returns for the early June stockings and to the greater number of fish showing movement greater than one mile from the early stockings. These early releases occurred at periods of nearly peak flows (Fig. 4) and a large number of these fish may have been flushed downstream.

One factor that was not quantified that may affect migration from stocking site is habitat quality. Habitat in the North Fork Payette River downstream from a point two-to-three miles above Moore Bridge is of much poorer quality than the rest of the river (Horner, personal communication), and fish stocked in the lower river may be more likely to move from the stocking location in search of better habitat. Unfortunately, movement data for the lower river is incomplete, since we were forced to discontinue stocking downstream of Sheep Bridge after 30 June due to high water temperatures. Angler effort was extremely low in this section and not enough tags were recovered to draw meaningful conclusions.

Movements of Trout to Cascade Reservoir

While the incidence of movement of fish into Cascade Reservoir from the lower river sections remains a question due to the low number of tag returns, the possibility certainly exists, since one tagged fish was reported caught from the upper end of the reservoir after migrating 15 miles from its release site (reports were received of several tagged fish caught in the reservoir, but we were unable to document them). The range of movement (up to 21.5 miles) seen by fish migrating distances greater than one mile illustrates that it is possible for a fish stocked at virtually any location in the study area to migrate to Cascade Reservoir. However, since the vast majority of fish stocked and recaptured in the North Fork Payette River remained within one mile of release site, I would expect an insignificant contribution to the Cascade Reservoir fishery.

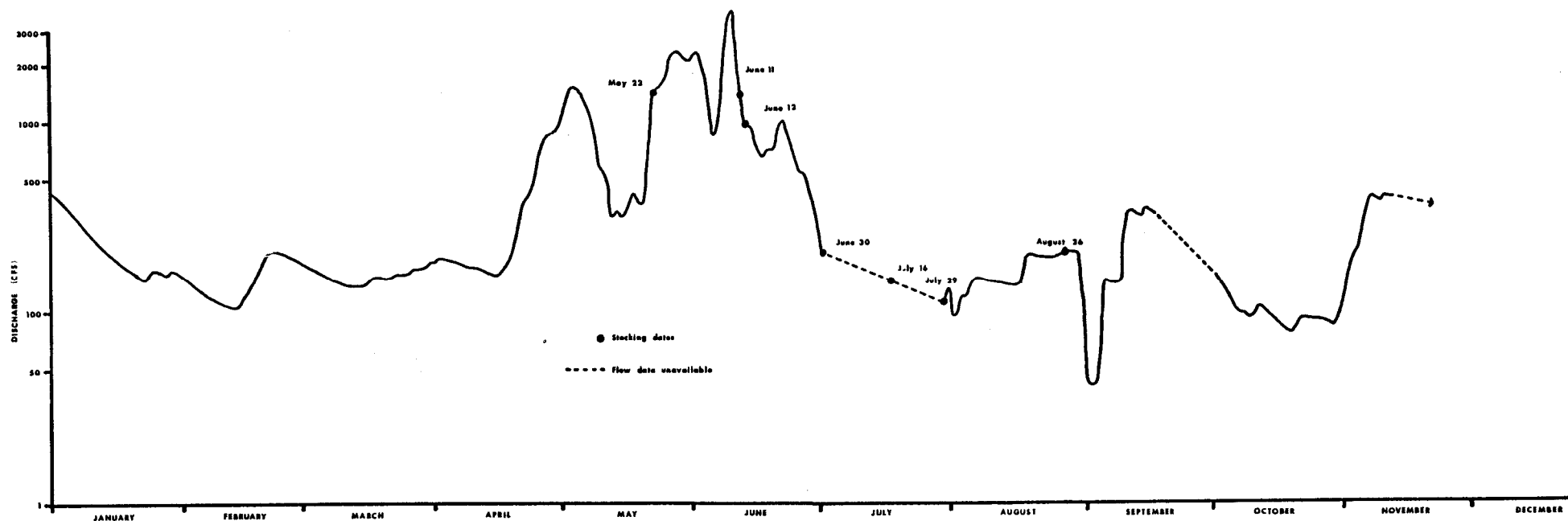


Figure 4. Discharge (cfs) of the North Fort Payette River at McCall, Idaho, 1 January-31 December 1931 (adapted from U. S. Geological Survey, 1981).

Some unmarked, catchable-sized, hatchery-reared rainbow trout were again noted during creel census on Cascade Reservoir in 1981, although fewer in numbers than in 1980 (Horner, personal communication). Hatchery personnel also noted untagged, hatchery-reared catchables caught from the study section. Apparently, substantial numbers of the catchables stocked in Payette Lake in the spring migrate out of the lake during high water periods. We observed many of these fish just upstream of the Payette Lake regulating dam at this time that presumably left the lake shortly thereafter. Some of these fish may have migrated to Cascade Reservoir. Another possible explanation is that some of the catchables stocked in Lakefork Creek or Gold Fork River migrated to Cascade Reservoir. Further study in 1982 will be needed to determine the source of these fish.

Length of Time in River Prior to Capture

Mean number of days a tagged fish spent in the river prior to being captured is a function of a number of factors, including fishing pressure exerted over time, the number of days fish were available for capture during the study period, and flow conditions in the river. Time spent in the river varied for each location and date stocked according to how these factors changed. Fish stocked 22 May, for instance, were subjected initially to much lighter fishing pressure, higher flows, and were available to the fishery for a longer period of time than fish stocked 30 June. Fish stocked 30 June were subjected to very intense fishing pressure, almost immediately, over the 4 July holiday, experienced lower river flows, so presumably, were easier to catch and were available for a shorter period of time. Consequently, the mean number of days spent in the river for the early stockings generally is slightly greater than for the late stockings (Table 2).

The majority of fish were caught in a fairly short period of time (Fig. 3). Slightly more than 50% were caught within three weeks after stocking. Cooper (1952) found similar results in the Pigeon River, Michigan, where 53.6% of tagged fish reported caught were taken within 20 days of stocking. Fish in Cooper's study were caught at a slightly faster rate after this point than those caught from the North Fork Payette River, however.

Angler Effort and Harvest of Tagged Trout

No angler counts were made during the study; however, by casual observation, it appeared that angler effort was low at the start of the study and gradually increased to a peak during the 4 July holiday. Effort remained high during the summer, peaked again during the Labor Day holiday, and then declined steadily. The vast majority of angler effort in the study area was localized at the dam, hatchery, and Sheep Bridge, with very little effort expended in other locations except for a moderate amount of pressure in the 0.5 mile section between the dam and hatchery.

Since we cannot determine what proportion of harvested, tagged trout were reported by anglers, an accurate harvest estimate of stocked fish is not possible. Other researchers in similar studies, however, have attempted to estimate the magnitude of unreported catches of tagged fish, and these range from a low of 20% to a high of nearly 87% unreported catches (Mullan 1953, Butler 1962, Moring 1980). If we experienced similar figures in this study, harvest of the 8,000 fish stocked might have ranged from 1,086 to 6,685.

Based on the number of anglers observed, and on the fairly high percentage of tagged fish reported caught, I feel fishing pressure does warrant stocking at least 8,000 catchable rainbow trout in the North Fork Payette River between Cascade Reservoir and Payette Lake. Stocking locations should be selected carefully, however, considering that few fish migrate great distances from location released, except perhaps in conditions of high flows or poor habitat. Fish should be stocked at locations where heavy fishing pressure is experienced to assure the greatest return to the creel. Since angler effort appeared to be extremely low below Sheep Bridge and habitat conditions were poor below the vicinity of Moore Bridge, stocking in these sections should be eliminated.

RECOMMENDATIONS

Stock differentially-marked catchable rainbow trout in the North Fork Payette River, Gold Fork River, and Lakefork Creek, and check for these during creel census on Cascade Reservoir in 1982 to determine the source of trout immigration into Cascade Reservoir.

Continue stocking in the North Fork Payette River with 8,000 to 10,000 catchable rainbow trout, provided that stocking be discontinued at locations below Sheep Bridge.

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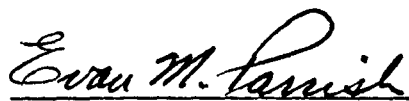
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Submitted by:

Patric F. Chapmen
Fish Hatchery Superintendent I

Approved by:

A handwritten signature in dark ink, reading "Evan M. Parrish". The signature is written in a cursive style with a prominent loop at the end of the last name. It is positioned above a horizontal line.

Evan M. Parrish
Fish Hatcheries Supervisor
Bureau of Fisheries